Report of surveys of the
Southern Railroad.

1853

REPORT OF SURVEYS

OF THE

SOUTHERN RAILROAD.

FROM

BRANDON, IN THE STATE OF MISSISSIPPI,

TO THE

ALABAMA LINE, IN THE DIRECTION OF THE CITIES OF CHARLESTON AND SAVANNAH.

BY H. HAUPT, CHIEF ENGINEER.

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1853.

Brandon, Miss., February 25th, 1853.

Hon. THOMAS A. MARSHALL,

President Southern R. R. Company:

Sir:—It affords me pleasure to be able to report that the explorations for the Southern Railroad have been completed; the proper route through the State of Mississippi has been determined; a paper location of the whole line, and an actual location of about forty miles have been made; maps, profiles, and estimates based upon the results thus far obtained, have been prepared, and I hope soon to present you with complete topographical maps of all the lines surveyed, amounting to about two hundred and fifty miles.

For the completion of this work at an earlier period than was anticipated, you have been indebted in a great degree to the energy and perseverance of the assistants in charge of the surveys, who were not deterred by any condition of the weather from steadily pursuing the labors of the field.

Necessarily inferring from your correspondence with the gentleman through whom my engagement with your Company was made, that you wished the surveys and location to be completed and the line prepared for contract with the least possible delay, I proceeded to organize two corps of assistants, and on the 10th day of October Mr. Lewis, with the first party, started from Philadelphia. Low water in the Ohio river, and the consequent scarcity of boats, produced vexatious delays, and it was not until the 10th day of November that the surveys of the first line could be commenced.

Mr. Foote, with the second party, followed after an interval of two weeks, with instructions to commence operations on the Eastern Division, at or near Decatur. Still greater delays attended the progress of this party, and December had made its appearance before the necessary equipage could be procured and they were enabled to take the field.

My engagements in Pennsylvania were closed on the first day of November, and I immediately started for Mississippi, having concluded to travel by way of South Carolina, Georgia and Alabama, and make a reconnoissance of the route in my passage across the State of Mississippi.

In Georgia and Alabama, I found a warm interest expressed in the success of the present efforts to complete the Southern Railroad. Some differences of opinion existed in reference to the best route across the State of Alabama, but all concurred in the opinion that the Road was vitally important to the cities of Charleston and Savannah, to all the connecting lines of Road, and to the States through which they passed. I was induced to believe that when the proper time arrived, assistance would not be refused.

Through the courtesy of Lewis Troost, Esq., Chief Engineer of the Alabama and Tennessee Railroad, I was favored with the results of his surveys in East Mississippi, and with much valuable information in reference to the topography of this portion of the State; from residents of Sumpter and Marengo counties, I also learned the position and character of the bluffs, the rise and fall of the Tombigbee and the extent of its inundations.

Thus prepared to proceed intelligently in the performance of my duties, I commenced a general examination of the country with a view to determine the point of commencement and the direction of the surveys of the second party whom I expected to meet at Decatur.

The eastern portion of the State was found to be extremely broken, and a direct line through Decatur so evidently impracticable that an instrumental examination was unnecessary.

In company with Mr. Foote, the country at the head of the Pottexchitto was examined, and finding appearances much more favorable than at any other point, I left directions to commence the survey of the Eastern Division at Wyeth's Summit on the east side of the Pottexchitto Creek, and proceeded to the encampment of Mr. Lewis in Scott county.

Having given the necessary directions to Mr. Lewis, and experienced much satisfaction from the gratifying progress that had already been made in the surveys, I reported to you at Vicksburg for further instructions and received directions to examine the whole country and make the best location of which its topography would admit, uninfluenced by any previous surveys or locations and regardless of any local or sectional considerations.

These instructions afforded great latitude, and the unusual privilege of making the location of one hundred miles of Road unfettered by fixed points even at the termini, was duly appreciated.

On the western portion of the line between Brandon and Taylor's Summit, three routes were indicated as being worthy of examination. The first of these was the location made in 1851, extending east from Brandon twenty-one and a half miles, and in the graduation of

which a considerable amount of labor had been expended.

The second route lay north of the first, and pursued a more direct line to Taylor's Summit. The third line followed the valley of Myer's Run, and passed about three miles south of Taylor's.

Although the third line conformed more nearly to an east and west course than either of the others, it was found to require so large an amount of local curvature that it was not only more expensive, but also longer than its competitors.

The remaining lines will be distinguished as the old and new locations, and in compliance with your instructions, the following comparative statements of grade, curvature, distance, and cost of construction, are submitted:

OLD LOCATION.

From the Engineer's report as published by order of the House of Representatives, it appears that the located distance from Brandon to the Ridge at Taylor's is twenty-one and a half miles, and the total cost of graduation $147,654.

The report does not state whether the whole or any considerable portion of the summit cut is included in this estimate, and from the fact that the grades are not extended or the cuttings calculated in the office records, a fair inference would be that this expensive portion of the line was not included either in the estimate of graduation or of distance. The old location will, however, be given the benefit of both, and it will be assumed that the whole of the cubic quantities have been inclu-

ded in the estimate of excavation, and the length of the cut added to the distance.

The grade from Brandon for a distance of thirty-six hundred feet, is 87 12-100 feet per mile. Beyond this point the report states "the grades are undulatory and do not exceed sixty-five feet to the mile."

From the maps and notes in the office, it has been estimated that between the summit at Taylor's and the point at which the new line intersects the finished Road, nine thousand eight hundred feet west of Brandon, the old location contains two hundred and eighty-seven degrees of curvature.

NEW LOCATION.

The new location, from Taylor's to the intersection with the graded Road west of Brandon, measures 22 67-100 miles.

The estimated cost of graduation and bridging, at rates exceeding those which are now paid on the Mobile and Ohio Railroad, and exceeding those at which it is believed the work can be completed, is $140,000—equivalent, for a distance of twenty-one and a half miles, to $132,700. If the distance from Brandon to the intersection be deducted from the length of the new line, the proportionate cost of the remainder, 20 82-100 miles, which is equivalent to the distance from Brandon to Taylor's, would be $125,000.

The highest grade on this line is (per mile) 39 6-10 feet. The total amount of curvature 134 degrees, making a difference in distance of 3,590 feet, in curvature of 153 degrees, in actual cost for equal distance of $14,954, and in actual cost for equivalent distance of $22,654 in favor of the new location.

It is customary, on important Roads, to estimate a saving of distance and curvature at very high rates. On the Pennsylvania Railroad, the assistants were instructed to save distance wherever it could be effected by an increased expense not exceeding $55,000 per mile, and curvature in comparative estimates of locations was valued at $33 per each degree. The determination of the value of distance on any Road is an easy problem when the probable amount of business is known or assumed. The data for its solution are the cost of graduation and superstructure per mile, and the capital which is represented by the annual cost of keeping the track in perfect condition, the wear and tear of machinery, the expenses of running trains, &c., per mile of distance. The determination of the proper allowance for curvature is a problem of a more complicated character, and no satisfactory solution is possible without more extended and carefully conducted experiments than have ever yet been made; but, waiving all calculations or speculations upon these subjects, it will answer our present purpose to assume that curvature and distance on the Southern Railroad should not be estimated at much less than one-half the values assigned to them on the Pennsylvania Railroad.

The difference in distance would, therefore, be equivalent to 3590 feet, at $5 per foot, - - $17,950
153 degrees of curvature, $16 per degree, 2,448
To which add difference in cost of graduation, 22,654

Total, - - - - - - $43,052

But a comparison between these lines as they now stand, would not do justice to the new location, inasmuch as the old line contains grades of 65 and 87 feet

to the mile, while in the new line no higher grade exists than 39 6-10 feet. To make a proper exhibit of the relative economy and comparative advantages of the two routes, the grades, slopes and dimensions of road bed must be the same in both. An application of these grades to a profile of the old location, gives the following results:

Graduation and bridging, - -	$188,279
Difference in curvature and distance, -	20,398
Total, - - - - -	$208,677
Deduct cost of equivalent distance of new location, - - - - - -	125,000
Difference in favor of new line, -	$83,677

An estimate was found in the office records, of the cubic yards of finished excavation and embankment on the road east of Brandon previous to March, 1852, amounting to 29,930 cubic yards excavation and 38,812 cubic yards borrowed embankment. A statement was obtained from J. H. Pool, Esq., who has superintended the graduation, from which it appears that a large number of the men belonging to the Company were, since the date of this estimate, employed in repairs of track, labor at depots, and in the surveys, and that for several months, the force at graduation has been small and inefficient.

From the data obtained, the value of the finished work east of Brandon may be estimated at $18,372. It is, perhaps, proper to remark, that in the comparison which has been submitted, there has been no disposition to place the old location in an unfavorable position; nor does it follow that, under the circumstances, it was not judicious. It was made by a gentleman of great

ability and professional experience, but he was, probably, required to conform to lines already located and to points previously fixed. The new line, on the contrary, has been located regardless of every thing but the topography of the country.

The high elevation of the town of Brandon, which the present Road reaches by grades exceeding 80 feet, renders it impossible to locate any line leading from it eastward, without a resort to similar inclinations; and as these grades necessarily governed the loads of the engines upon the road, their use on other parts of the line was not very objectionable.

No further explanation will, perhaps, be necessary to account for the difference which is found to exist between the lines which form the subject of comparison.

My duty, however, is not that of an apologist; it is simply to place before you the results which an instrumental examination has elicited. I have endeavored to communicate them in as condensed a form as possible.

SUMMARY OF RESULTS.

It appears from the preceding statements, that if a comparison be made between the old and new locations based upon similar grades, slopes and width of road-bed, and allowing for curvature and distance, the difference in favor of the new line will be $83,677, or 65 per cent. of its cost.

With grades of 39 6-10 feet upon the new line, and 65 and 87 upon the old, the difference for equivalent distances between Brandon and Taylor's summit will be $43,052.

If the 9,800 feet of finished road west of Brandon, which includes all the heavy work on the 84 ft. grades,

and all the work done by the Company east of Brandon, should be abandoned and the new line adopted, a comparison of expenses would stand thus:

Estimate of old location, - -	$141,654
Add for filling of trestle work east of Brandon, - - - - - - -	5,900
For difference of curvature and distance,	20,398
	$173,952
Deduct value of work done east of Brandon by Company, - - - - -	18,372
Cost of finishing old line in comparison with new, - - - - -	$155,580
Deduct cost of new location, - -	140,000
Difference in favor of the abandonment of the old line, - - - - -	$15,580

My duty is performed in submitting these facts; it remains for you to use the results as in your opinion the best interests of the Company and of the State may require.

The new location leaves Brandon one mile to the south, and connects west of the trestle work upon the finished road. That it would be expedient, with legislative sanction, to adopt this line, I am not prepared to assert. Such questions your Board must decide, and the decision will no doubt be such as circumstances render proper. But if it be considered advisable in the future operation of the road to continue to run the trains through Brandon and keep a supply of assistant engines for this purpose, a connection between the old and new locations can be made at a point 2½ miles east of Brandon by a short line of one mile, without increasing

distance on the old location or increasing cost on the new.

It is proper to remark, in this connection, that no grade exceeding 40 feet to the mile exists on any of the connecting roads between the Mississippi river and the Atlantic east of Brandon, except at Aikin in South Carolina, where a higher grade was used to avoid an inclined plane. This fact would justify a considerable sacrifice if it were necessary to reduce the grades to the same maximum limit on a Road which, when its connections are completed, must become one of the most important in the Union. The low grades upon your road will be secured with but little cost. With the exception of three points, which could not be greatly cheapened by increased grades, you have almost a surface line.

DESCRIPTION OF ROUTE EAST OF TAYLOR'S SUMMIT.

From Taylor's to Wyeth's Summit, at the head of the Pottexchitto Creek, the line traverses the flat woods as they are generally called, although the surface is quite as undulatory as on other portions of the route. Between these two points, two lines have been located, and a comparative estimate determined that which is most favorable.

To avoid the great head of the Pottexchitto, several lines were surveyed from Wyeth's Summit and a location made on the least expensive. It contains but a small amount of curvature, and is practically equivalent to a straight line.

A perfectly straight line could have been located almost through the entire extent of Scott and Newton

counties without a sacrifice that would by many have been considered excessive, but no good reason can be given for making any sacrifice to secure a purely imaginary advantage. With large and equal radii, equal curvature and equal distance, a line with tangents of medium length is practically as favorable in every respect as one with fewer and longer ones, and as the changes of direction that have been found expedient have been made with curves of long radii, the line as a whole, through Scott and Newton counties, and in fact for almost the entire distance from Brandon to Lauderdale, may be considered as almost equal to a straight line.

Near Lauderdale county, the country assumes a much more broken character. It was no longer practicable to follow the valleys of the streams, and it became necessary to cross them and the intervening ridges transversely.

The plan was adopted of running crest lines along the ridges to determine the relative positions and elevations of the summits, and lines were surveyed wherever sufficiently favorable features were presented. A large portion of the time occupied in the survey was expended in these examinations, but the result has been conclusive and satisfactory. Although the high points of these ridges are nearly 300 feet above the streams which flow along their bases, they have been overcome with grades of 39 6-10 feet, and with much less local curvature and increased distance than was expected at the time of the first general examination. The former or Tracy survey crossed the "mountainous ridge," as it is called, upon a grade of 85 feet to the mile, at an elevation nearly 40 feet higher than the present summit and with a long cut of 95 feet in depth.

The present line crosses the same ride, but at a more favorable point, with a grade of 39 6-10 feet, with a cut much shorter, and 15 feet less in depth, through a material that will be easily excavated.

The general similarity in the geological features of the country in Newton and Lauderdale counties, led me to believe that the surface of the country had once been nearly level, and that the "mountainous ridges" that now exist were formed by the action of the streams for ages deepening their beds, and transporting the alluvion to distant points; that the high ridges of Lauderdale were, in fact, no higher than the flat woods of Scott county. This opinion was confirmed by the result of the surveys. The table lands at the head of the Pottexchitto, the summit of the Gardiner ridge between the Chunkey and Oktibbeha Creeks, and the high ridges east of Marion, do not vary greatly from the same general level.

The line surveyed strikes the county line of Lauderdale near Lewis' Mills on the Chunkey. At this place the Creek makes a bend of several miles to the north, and returns to within 300 yards of the same point. The dividing ridge opposite the Mill is low and narrow, and presents but little difficulty in the construction of the road. The material which the cut will contain is a soft rock of the consistence of chalk.

From Lewis' Mills, the former survey crossed the ridge between the Chunkey and Tallahatta, in the direction of Maxwell's Mill. This route was explored, but found to be impracticable with grades less than 80 feet, and as the ridge terminated about one mile to the south, it was considered preferable to avoid it by a slight increase of distance.

The point of the Tallahatta ridge is covered with a great mass of solid and durable rock lying in a favorable position for quarrying and transportation on the Railroad, and after the track is laid, will afford abundance of material for all the permanent bridges on the line.

Leaving Tallahatta, the line ascends Cuo and Brush Creeks to a summit which an examination of the whole ridge proved to be most eligible. Crossing this summit with a cut of 80 feet through a soft rock, the line follows the course of several reed brakes to a second summit in the spur which divides the waters of two of the small tributaries of the Oktibbeha Creek. Here a cut of 40 feet through clay and sand, communicates with a ravine which affords an outlet to the valley of Barnell's mill, at Daniel's plantation, and here, after crossing a third but comparatively unimportant ridge, the line reaches the flats of the Oktibbeha.

Between the Oktibbeha and the Sowwashie, no difficulties are found to exist. East of the Sowwashie is a bold ridge of nearly 300 feet elevation, which separates its waters from those of the Buckatuna creek. Through this ridge there appears to be no practicable outlet, and the line pursues the north-east course of the valley to the mouth of the Nanaby creek, where it resumes its eastward course, passes one and a half miles south of Marion and crosses the main ridge between the waters of the Pascagoula and the Tombigbee, at Simms' summit.

This ridge, as well as the former one, was the subject of my extended observations, and it was not until crest lines had been run and every summit examined instrumentally, that the extension of the line eastward was

resumed with full confidence that the best route had been determined.

From Simms' summit, the line follows the course of the little Toonsoba for several miles, in a direction a few degrees north of east. At the plantation of Major Brower, it crosses a low and remarkably favorable summit between the waters of the Toonsoba and Allamucha creeks, follows a branch of the Allamucha to within half a mile of the State line, and then runs east to the valley of the main stream intersecting the State line on the plantation of H. Bronson.

The route, as a whole, is extremely favorable, with the exception of the three cuts at the crossing of the great ridges, the united expense of which will not exceed $100,000. The remainder of the graduation will be light and inexpensive, and the whole cost of graduation, including temporary bridges, will be less than $6,000 per mile.

The cost of permanent bridges will be but light, if they are not built until after the track can be used in the transportation of materials. Many of the crossings can be avoided by excavating new channels for the smaller streams, the material for which can be used for embankment.

This report has been hastened, in the belief that you wished to be informed, as early as practicable, of the results of the survey. All that remains to be done is to stake out a portion of the located line, prepare revised estimates of the whole, and finish the profiles, topographical maps and plans of bridges.

The field work on the eastern division will probably occupy the party two months, when their services can be dispensed with if you think proper. The western

division is ready for contract whenever you deem it expedient to let it.

The whole length of the line from Brandon to the State line will be 99 1-6 miles. The length of an air line is 93 1-5 miles. Difference, 5 96-100 miles, or an increase of 6⅕ per cent.

The maximum curvature is 5 degrees, or 1,146 feet radius, and this is used but once. The changes of direction are most frequently made with curves of one degree, or 5,730 feet radius.

The results of the survey are more favorable than were anticipated, and although slight improvements may be found possible in the adjustment of the line in detail, I have no doubt that the general direction is the best that the topography of the State will afford.

$600,000 will grade the road, $50,000 will furnish cross-ties, $40,000 will distribute material and lay the track, but the whole cost of superstructure depends so much upon the price of iron that it is difficult to form an estimate of its probable cost at the time when you will require it. From present indications, however, iron of proper weight will not be delivered for less than $7,000 per mile, including turn-outs, and at this rate a rough estimate of grading, bridging, superstructure and equipment for a moderate business, will be $1,600,000.

If iron could be bought as formerly, at $50 per ton, this estimate would be reduced $200,000; but as the rise appears to be due to causes of a permanent character, it is not probable that you will be able to purchase it at these rates.

With this report will probably terminate my active participation in the construction of the Southern Railroad. The duties which I had undertaken to perform

are now discharged, and I am about to bid farewell to the "sunny South;" but in taking my departure, I cannot avoid an expression of acknowledgment for the courtesy and attention which I have received from yourself, your colleagues in the directory, and the friends of the road generally. The acquaintances that I have had the honor to form during my short sojourn in Mississippi will not soon be forgotten.

The charge of the Road can be safely entrusted to Mr. R. B. Lewis, whose character for energy, intelligence and sound judgment is fully established, and to whom instructions have been given that fully cover the duties to be performed.

With the best wishes for the early completion and entire success of the great work in which you are engaged, this report, with accompanying papers, is respectfully submitted.

H. HAUPT, *Chief Engineer.*